

The RHIC Abort System

Performance and Issues

(Integrated approach – list problems and resolutions together)

pre-triggers

quenches

timing (abort gap – kicker trigger)

quiet discharges

communication breakdown (pet-hardware)

nagging fears – how is the absorber doing?

RHIC Retreat 2002

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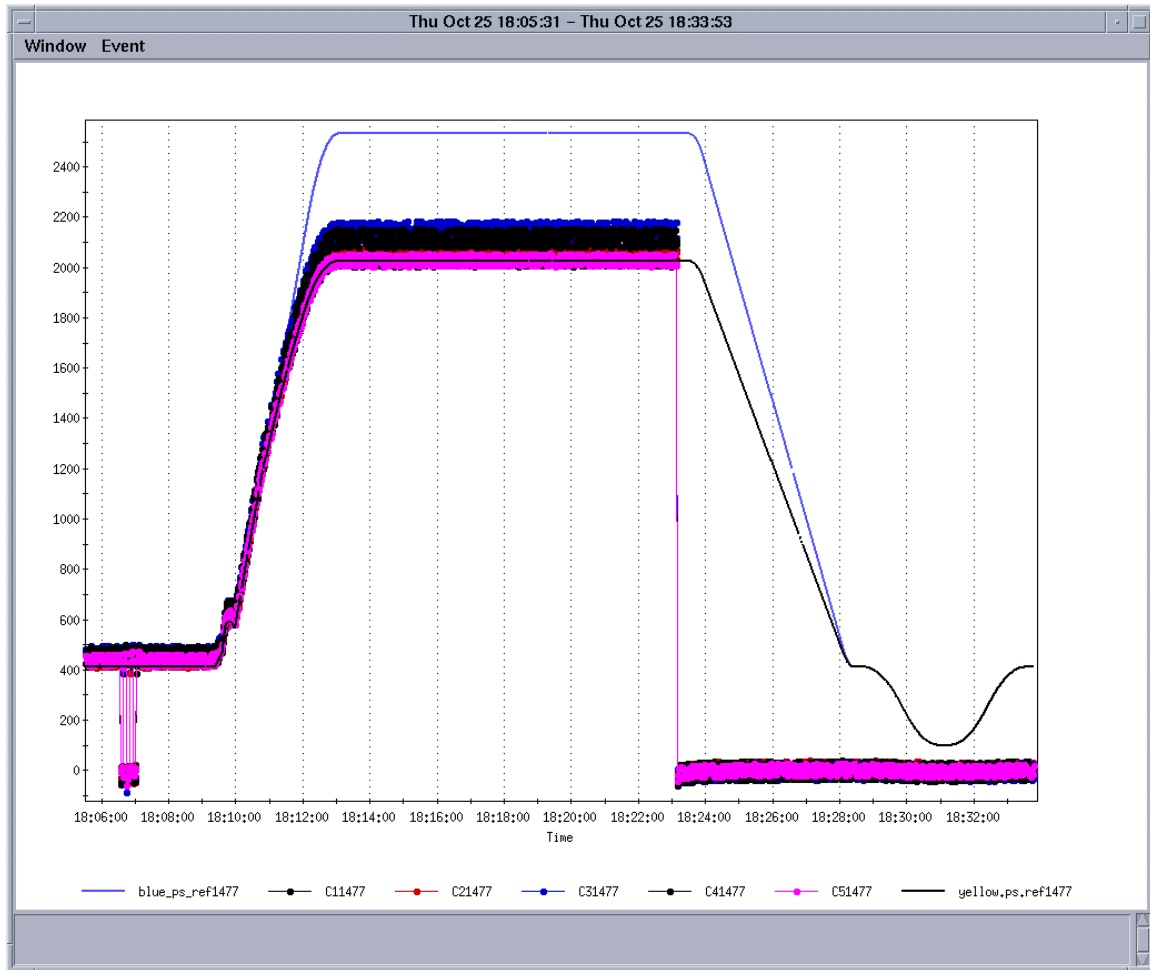


Figure 1 Not RHIC Magnetic Field ...

Voltage (reference and readbacks) to the Blue and Yellow Abort System PFN's during a short RHIC cycle. Voltage on the vertical axis, 2000 = 20 kV. Time on the horizontal axis (hours:min:sec). The fuzzy lines are voltage readbacks from the 5 Yellow pulse forming networks. The thin curves are the references sent out. Note that Yellow is requested to ramp to a lower value than Blue. This reduction represents a 20% smaller kick a Store, and its implementation correlated in time with the end of prefires.

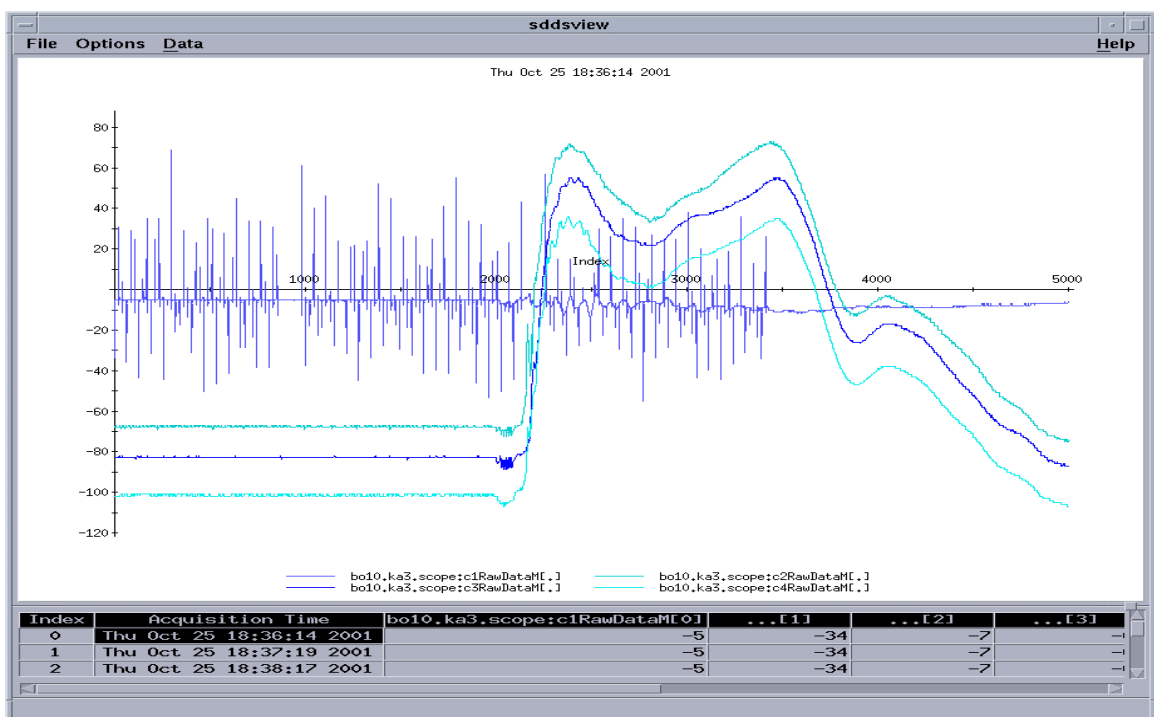


Figure 2 Kicker Currents (in Blue) and Bunch Hummies
note the abort gaps, they bracket 55 bunches of beam

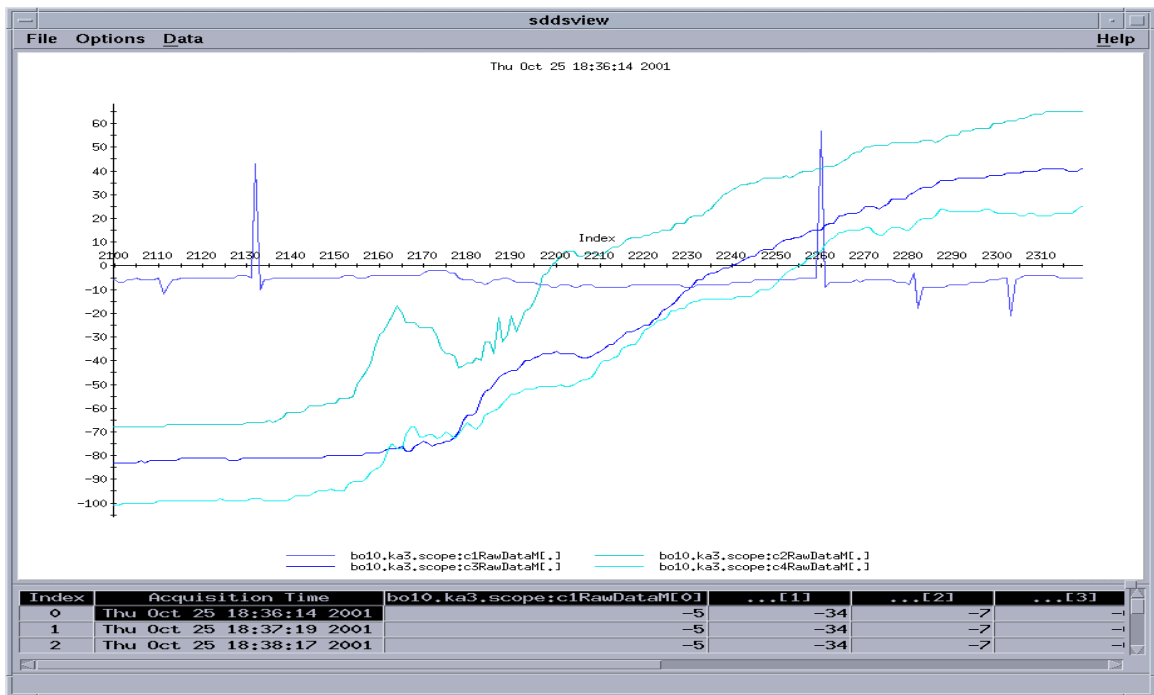


Figure 3 A Blow Up - Showing Timing Resolution (10 ns/point)

Pre-triggers

Significance not really anticipated

- not the loss of Stores
- not the Radiation Safety concerns
- but yes the damage to experiments (Phobos)

response

- commission 'fast' backup trigger
 - not fast enough
- lower Yellow kick strength (fig 1)

improve "postmortem" diagnostics but still have holes

plan

- backup trigger system in the ring
 - (A Big Deal – Arleen Zhang is working on this)
 - Still leaves 1 usec of delay before the rest kickin.

(to guarantee collecting the relevant traces in a fault need another scopes – too fast for GPM; and more 'intelligent' triggers for data logging.)

Quenches (following Dumps)

Primarily (not solely) in Blue

Frequently not 'expected' pattern – not 12 o'clock IP triplet quad
rather the “bus” in 10 o'clock – cannot extract a unique spot from quench data.

Blue and Yellow loss patterns qualitatively same, but Blue higher both downstream of absorber and all the way around and back to the kicker

Debunched beam contribution

Diagnostics good – the loss monitors give plausible patterns

No real progress – have we damaged the absorber?

one especially odd quench led to timing revisit (next slide)

Timing

(Abort gap vs Kicker trigger)

depends on decoding “rev tick” from Beam Synch Clock

Set up during short beam study early on (June 2001)

- use BPM system, kick and watch beam disappearance pattern as adjust timing.

Revisited after unexplainable 6 bunch quench
(4 months after original setup)

Find 2 bunch shift, kick coming late – but when corrected no qualitative change in loss patterns.

Here we introduced 55 bunch rule (from 56) just to gain more timing margin. This we will remove again next run.

plan: Implement more diagnostic recording – still have holes

Fig 2,3

Quiet Discharges etc.

PFN Voltage occasionally slowly goes to zero during Store

Can result in very messy beam loss when ramp down

Not a fundamental problem – need not even lose Store if can react.

Present status - Sequencer notices and alarms.
Operations reacts carefully. (I think)

Communications loss between MCR (pet page) and hardware

PLC involved, some missing readbacks, work to be done.

Nagging fears:

No direct diagnostics monitor the condition of the absorber. Only the evolution of the loss pattern over the years – which is not handled quantitatively.

Should we be monitoring something else?